US Army Medical Research and Materiel

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Method and Apparatus for Power Doppler Ultrasound Image Analysis

Features and advantages:

- **Detection of blood flow velocity of less than 1 cm/sec in ultrasound images may be possible**
- **Provides a non-invasive method for measuring blood flow**
- **Eliminates anatomical features of the organ from the image**
- **Validated in porcine models of renal arterial occlusion and reperfusion, and of burn shock**
- **May allow detection blood flow and serve as a guide to resuscitation**

This invention provides a method and apparatus for estimating the amount of blood flowing to the tissues of the kidney. The invention analyzes power Doppler ultrasound (PDUS) images taken of the kidney cortex tissue and then produces a numerical value that correlates to the blood flow. The user selects a PDUS image of the kidney that shows blood flow in a region of interest. A histogram of the region of interest is then performed, and an image intensity based on the histogram is calculated.

Patients suffering from shock, including shock following severe burns, have impaired blood flow to their vital organs. Restoration of blood flow to these organs, including the kidney cortex, is a therapeutic goal. Clinicians frequently estimate kidney blood flow by measuring the amount of urine produced per hour. However, in several classes of patients, including those with acute renal failure and those who have received drugs which artificially increase the production of urine, urine output measurements are not reliable indicators of kidney blood flow.

The ability to detect blood flow in smaller vessels did not exist until the advent of PDUS, which provide spectral [illegible] of the received sound and integration of the resulting amplitude-frequency function to permit display of a perfusion index for each pixel. PDUS is likely to be able to detect blood flow velocity of less than 1 cm/sec in tissue images. The invention may provide a quantitative assessment of changes in organ perfusion at the capillary level during ischemia, reperfusion, and following burn injury.

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